LEGO Education
STEM Robotics with
Mindstorms EV3

STEM Unit
Agenda

● Introduction and Educational Robotics
● History of LEGO Mindstorms
● Mindstorms Kit and Build
● Hands-On Activities
● Curriculum Links
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Technology Integration Specialist for Naperville SD203

Professional Certifications:

● LEGO Education Academy Certified Trainer
● Apple Foundations Trainer
● Google Certified Educator Levels 1 & 2
● Carnegie Mellon Robotics Academy EV3 Instructor Certification (Gold)

Professional Passions:

● STEM and Robotics
● FIRST LEGO League Coach
● FIRST LEGO League Jr. Coach and LEGO Foundation Grant Recipient
● Innovative and Emerging Technologies

Personal Passions:

● Spending time with Family & Friends
● Travel
History of LEGO Mindstorms

- Seymour Papert
- MIT and LOGO
- LOGO Turtle
- LEGO Programmable Brick
Why Robotics in the Elementary School?

Definition of Robotics - the design and application of robots

- 1 of 6 important developments in educational technology
  - Time to Adoption - 2 to 3 years
- Global *robot population* is expected to double to *4,000,000 by 2020*
- Enable people to *simulate*, *observe* and *make sense of complex tasks*
- Promote *Critical* and *Computational Thinking* as well as *Problem-solving*
- Effective way to introduce and bolster *STEM learning*
- Governmental STEM Education strategies based on robotics activities

- *New Media Consortium Horizon Report: 2016 K-12 Edition*
LEARNING TARGETS - PEs

3-5-ETS1-2 Engineering Design

I can generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
LEARNING TARGETS - SEPs

Science & Engineering Practice Standard #1: Asking questions and defining problems.

I can ask questions to define an engineering problem.

Science & Engineering Practice Standard #2: Developing and using models.

I can construct conceptual models to understand phenomenon.

Science & Engineering Practice Standard #7: Engaging in argument from evidence.

I can examine my own understanding in light of the evidence.
PHENOMENA
Observable events that can drive student learning

PHENOMENON
Autonomous (Self-driving) Cars
Days One and Two: Introduction and Build
I can construct conceptual models to understand phenomenon.

Introduce STEM and the Phenomenon

Introduce the Mindstorms Kit

Build the Robot with its sensors

- Driving Base p.7-38
- Ultrasonic Sensor
- Color Sensor p. 69 - 71
- Color Block p.4 - 6
Day Three: Moving Straight
I can use informational text and instructional videos to locate and apply needed information.

Watch **Big Ideas Tab 1-2** and answer the questions that follow

Watch **Moving Straight Tab 1** video and answer the questions that follow

Watch **Moving Straight Tab 3** video. While you watch, go to the programming software on your device and do what they are showing you. Answer the questions that follow the video.

How can you make it go backwards?

**QUESTIONS TO DEEPEN YOUR UNDERSTANDING**

Can you make the robot go farther?

Can you make it go faster? Slower?

Predict what will happen if you set the power level to 0. Were you right?

Make your robot go precisely 50 cm.
Day Four: Turning
I can use informational text and instructional videos to locate and apply needed information.

Watch Turning Tab 3 video. While you watch, go to the programming software on your device and do what they are showing you. Answer the questions that follow the video.

Can you make your robot turn precisely 90 degrees? Compare your solutions. Is there more than one way to do this?

How would you change the direction of the turn?

Can you make the robot do a 180 or 360 degree turn?

QUESTIONS TO DEEPEN YOUR UNDERSTANDING

Can your robot make a square? Can it do a dance?

What happens if you change the steering to 50? How does this affect the turn?

Can you boomerang your robot from you to your partner and back?
Final Challenge - Autonomous Robots

I can generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

Program your robot to move autonomously through a maze.

**CRITERIA**

The robot must move from the starting area to the goal area on its own.

**CONSTRAINTS**

The robot may not cross over any solid black lines.